Entergy,
Our Bay is Not Your Dump:

A call to EPA and MassDEP to terminate Entergy's Clean Water Act permit for Pilgrim Nuclear and end the destruction and pollution of Cape Cod Bay

Fishermen at the landing site on White Horse Beach in Plymouth, near the Pilgrim site. Harvests of Irish moss, stored in collection nets, are being lifted out of the two boats. (Lawton R., et al. 1992).

CAPE COD BAY WATCH

Jones River Watershed Association

Cape Cod Bay Watch (CCBW) is a program of the Jones River Watershed Association (JRWA) in Kingston, Massachusetts. JRWA was established in 1985 and its mission is to protect and restore the ecosystem of the Jones River, the largest river emptying into Cape Cod Bay. JRWA maintains its offices at 55 Landing Road, Kingston, MA.

For more information: www.capecodbaywatch.org, www.jonesriver.org

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Dedication: This report is dedicated to the long line of concerned citizens who have advocated to protect the environment and public health from Pilgrim's impacts, beginning in the 1960s.

Acknowledgements: The authors gratefully acknowledge the support of Civil Society Institute, without which this report would not have been possible.

The call to terminate Entergy' Clean Water Act "National Pollutant Discharge Elimination System" (NPDES) permit for the Pilgrim Nuclear Power Station in Plymouth, Massachusetts is endorsed by the following organizations.

Association to Preserve Cape Cod
Beyond Nuclear
Biofuelwatch
Boston Downwinders
Cape Cod National Seashore Advisory Commission
Cape Downwinders
Clean Water Action
Concerned Neighbors of Pilgrim
Conservation Law Foundation
Davistown Museum
Down Cape Downwinders
Eel River Watershed Association
Herring Alliance
Jones River Watershed Association
MASSPIRG
On Behalf of Planet Earth
Pilgrim Coalition
Pilgrim Watch
POCCACapeCod.org
Public Laboratory for Open Technology and Science 501(c)3
Safe and Green Campaign
Sands of Whitehorse Beach Association
Three Mile Island Alert
Toxics Action Center

June 8, 2015

Executive Summary

This is a call to state and federal regulators to terminate Entergy's Clean Water Act "National Pollutant Discharge Elimination System" (NPDES) permit for Pilgrim Nuclear Power Station in Plymouth, Massachusetts. Entergy's NPDES permit expired in 1996, over 19 years ago. Under the guise of the NPDES permit, Pilgrim's outdated "once-through" cooling water intake structure (CWIS) has been destroying marine resources in Cape Cod Bay and polluting our water since 1972. Cape Cod Bay and its natural resources belong to the public. The Bay is not Entergy's private dump, nor its to destroy.

Entergy's CWIS harms Cape Cod Bay in many ways including:

- Killing tens of millions of fish and billions of planktonic organisms every year.[1]
- Dumping roughly 500 million gallons of hot water mixed with pollutants into the Bay each day, which disrupts and destroys ecosystem processes.
- Most of the energy produced is wasted: only 34% of the thermal energy produced by using Cape Cod Bay's water is converted to electricity – the remaining 66% of the energy produced is discharged into the Bay in the form of hot water.[2]

Numerous state and federal laws such as the Clean Water Act, the Magnuson-Stevens Fisheries Conservation Act, the Endangered Species Act, and the Coastal Zone Management Act require Entergy to eliminate or at least mitigate Pilgrim's impacts on the Bay. These laws are not being enforced. The Massachusetts Department of Environmental Protection (MassDEP) and the U.S. Environmental Protection Agency (EPA) are unable or unwilling to update Entergy's NPDES permit or even attempt to prevent, or mitigate, Pilgrim's environmental destruction. The most obvious example is the gradual eradication of the once prevalent, benthic, Irish moss. Moreover, it is unlikely that the cumulative impacts of Pilgrim's 43 years of marine destruction and pollution will be studied, even if the NPDES permit is ever renewed. For years, calls from the public for prompt action have been left unanswered.

Given the failure to act by EPA and MassDEP and the massive scale of Entergy's environmental destruction and pollution, termination of Entergy's NPDES permit is the only option. Entergy's operation of the CWIS under the expired permit should be suspended until the public is guaranteed that no further environmental destruction will occur. This means that Pilgrim should stop operating until a current, valid, and updated NPDES permit is in place.

List of Acronyms and Abbreviations

BTA	best technology available
CWA	Clean Water Act
CWIS	cooling water intake structure
CZMA	Coastal Zone Management Act
DSEIS	draft supplemental environmental impact statement
DMF	Division of Marine Fisheries (Mass.)
DMR	discharge monitoring report
EA	adult equivalent
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
JRWA	Jones River Watershed Association
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation & Management Act
MassCZM	Massachusetts Office of Coastal Zone Management
MassDEP	Massachusetts Department of Environmental Protection
MWe	megawatts electric
MWt	million watts thermal
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA's National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
PATC	Pilgrim Administrative-Technical Committee
Pilgrim	Pilgrim Nuclear Power Station
USFWS	U.S. Fish and Wildlife Service

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I. Destruction of Public Trust Resources and a Failed Regulatory System

This report exposes the failure of the Environmental Protection Agency (EPA) and Massachusetts Department of Environmental Protection (MassDEP) to properly regulate the Pilgrim Nuclear Power Station (Pilgrim) under federal and state environmental laws. By allowing Pilgrim to continue operations under an expired Clean Water Act (CWA) NPDES permit (National Pollutant Discharge Elimination System), these regulators create the illusion that Entergy's operations are not harming the environment or destroying marine resources. Entergy's own records and agency's documents show that Pilgrim causes massive destruction of Cape Cod Bay resources, as described here.

A. Background on Entergy's Pilgrim Nuclear Power Station

Entergy Corporation's[3] Pilgrim Nuclear Power Station is located on the shore of Cape Cod Bay in Plymouth, Massachusetts. Pilgrim is a Mark I "boiling water reactor" made by General Electric.[4] This is the same design as the nuclear reactors that melted down during Japan's Fukushima Dai-ichi nuclear disaster in 2011.

Pilgrim has the capacity to generate up to 2028 million watts thermal (MWt) that it uses to produce up to 690 megawatts electric (MWe).[5] Pilgrim is a merchant plant that sells its electricity to the New England electric grid. Entergy bought Pilgrim from Boston Edison Company in 1999.

Nuclear power plant operations are regulated by U.S. Nuclear Regulatory Commission (NRC). The NRC first licensed Pilgrim in 1972 when it granted an operating license to Boston Edison. The license was transferred to Entergy when it bought Pilgrim.

From 1986 to 1988, Pilgrim was closed by an order of the NRC[6] due to mismanagement and operating errors resulting in an accident that released excessive radiation into the surrounding community.

Pilgrim is one of the worst performing commercial nuclear reactors in the U.S. In 1982, the NRC penalized Boston Edison $550,000 for violating regulations.[7] In May 1986, Pilgrim was ranked as one of the most unsafe reactors in the U.S. out of approximately 100.[8] Despite Pilgrim's deteriorated condition and poor safety record, in 2012 the NRC extended Pilgrim's license to 2032.[9] The next year, in 2013, the NRC further downgraded Pilgrim due to operating failures and ranked it among one of the 22 worst performing reactors. Pilgrim was then placed under heightened federal oversight, which continues

today.[10] In 2014 and 2015, the NRC further downgraded Pilgrim to one of the 10 worst performing reactors.[11]

B. Entergy's Cooling Water Operations

Under the CWA NPDES permit, EPA and MassDEP allow Entergy to take up to 510 million gallons (more than 350,000 gallons per minute) of water from Cape Cod Bay each day via Pilgrim's "once-through" cooling water intake structure, or CWIS (Figure 1). Pilgrim's cooling water system is needed to remove waste heat generated by reactor operations.

As a boiling water reactor, Pilgrim uses nuclear fission to boil water and create steam. The steam runs turbines that generate electricity. Water from the Bay is used to cool and condense the steam, and then the cooling water is discharged back to the source. Pilgrim's process to generate electricity is only 34% efficient, meaning for every three units of thermal energy generated by nuclear fission in the reactor, only about one unit of energy makes it to the grid in the form of electricity. Most of the heat produced is discharged as waste heat into the Bay (66%; Figure 2).

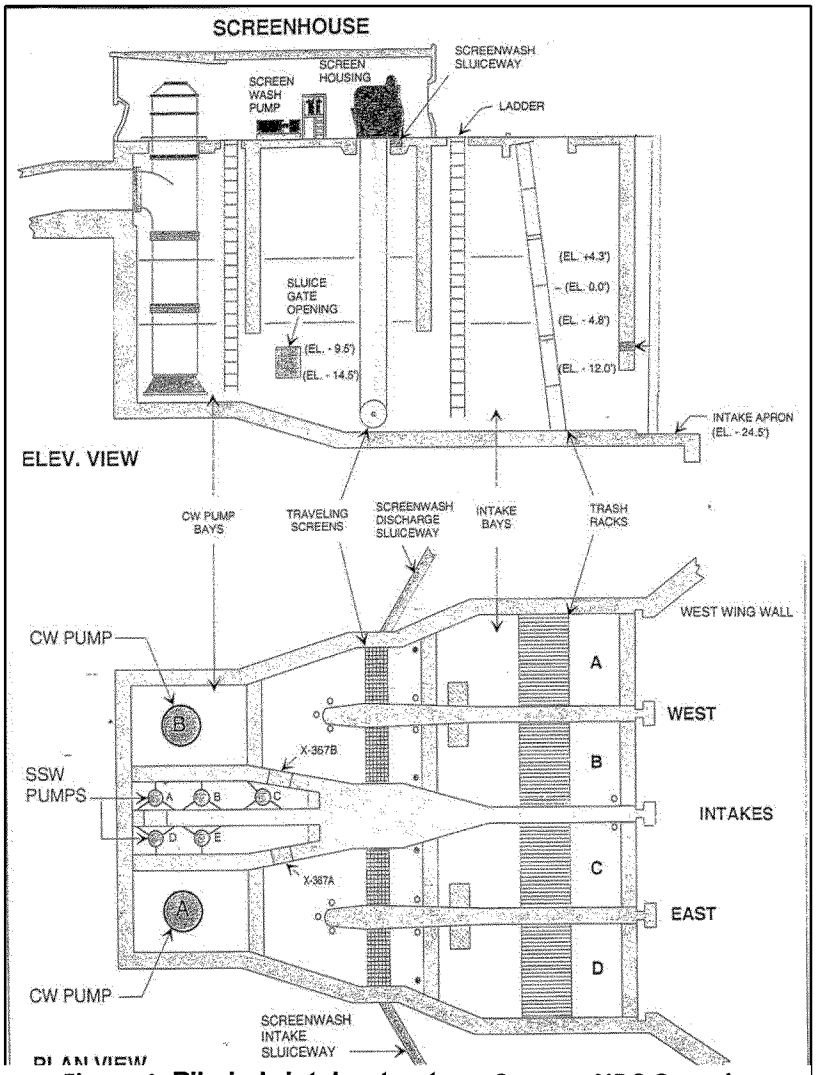


Figure 1. Pilgrim's intake structure. Source: *NRC Generic Environmental Impact Statement for license renewal of nuclear plants.* NUREG-1437, Supp. 29. (PNPS) Vol. II (Appendices), page E-58 (diagram by ENSR, 2000).

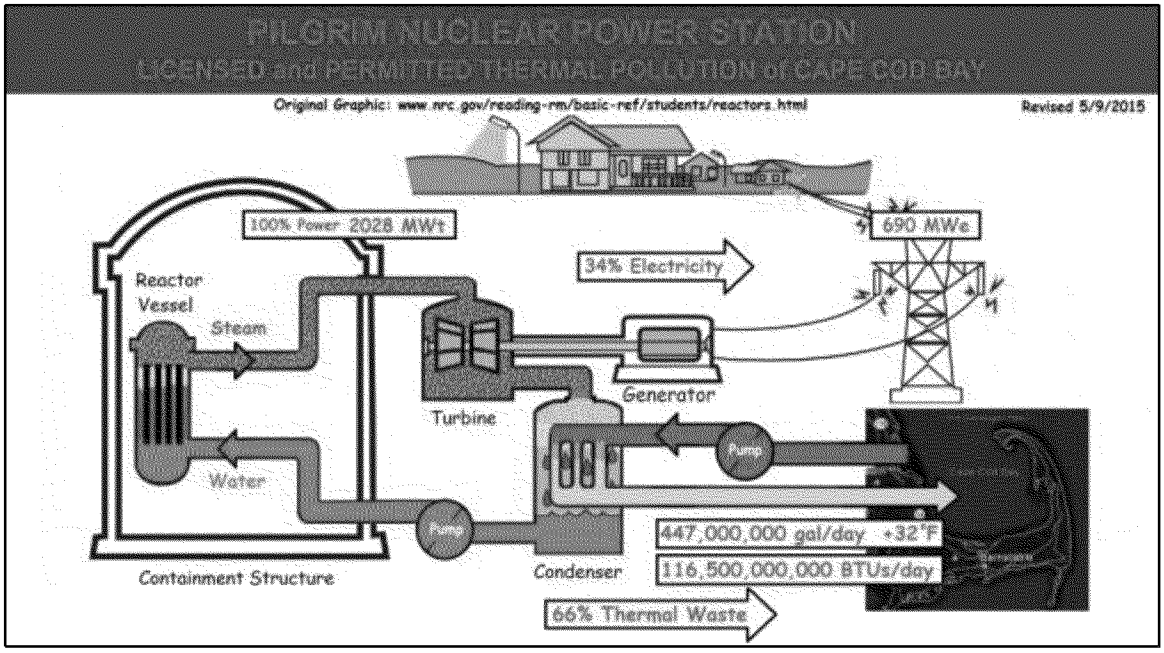


Figure 2. Diagram of Pilgrim's once-through cooling system; two-thirds (66%) of the thermal energy is discharged into Cape Cod Bay as waste heat.

After sea water cycles through Pilgrim for about fifteen minutes, the expired NPDES permit allows Entergy to continuously dump the used cooling water into Cape Cod Bay that is a maximum of 102□F, and up to 32□F hotter than the Bay's ambient temperature. During periodic backwashing/cleaning operations, the permit allows Entergy to discharge polluted water into the Bay that is a maximum of 120□F. See Part II(A)((1) below.

Figure 3. Pilgrim Nuclear Power Station. Showing jetties, cooling water intake canal (center), and discharge channel (right). Photo Courtesy of Marc Costa/Center for Coastal Studies/Light Hawk.

Entergy's CWIS causes massive environmental destruction and pollutes Cape Cod Bay in five ways,[12] detailed in this report and appendix.

(1) **Impingement** of marine life such as fish and shellfish happens when marine life is drawn onto Pilgrim's intake screens. Adult or juvenile fish may be killed immediately due to mechanical abrasion and suffocation.[13] If impinged organisms survive, the stress from getting trapped on the intake screens may lead to mortality from exhaustion, lowered resistance to predation or disease, reduced ability to feed, or external or internal injuries.[14] See Appendix, Part I.

(2) **Entrainment** of smaller marine life such as the eggs and larvae of fish and shellfish, and other planktonic organisms occurs when they are drawn through the screens and into the cooling water system where they are exposed to hot water, chemicals, and battered by mechanical equipment. Once the cycle is complete, the entrained marine life is dumped back into Cape Cod Bay via the discharge canal with the cooling water now contaminated with chemicals (e.g., corrosion inhibitors and chlorine) and waste heat. See Appendix, Part II.

(3) **Thermal pollution or dumping hot water, chemicals and radioactive waste**[15] directly into the Bay (Figure 4).

(4) **Scouring of the sea floor** and destruction of benthic organisms from the unrelenting force and heat of the discharge.

(5) **Dumping industrial storm water runoff** into the Bay from storm drains that are improperly managed and not in compliance with current laws.

Figure 4. Pilgrim Nuclear: Discharging pollution into Cape Cod Bay. Photo courtesy of Marc Costa, Center for Coastal Studies/Light Hawk.

C. Entergy's Expired Clean Water Act NPDES Permit

EPA and MassDEP are allowing Entergy to use an outdated CWIS that has not changed since Pilgrim was built in the 1960s. They have allowed Entergy's NPDES permit to expire and are not properly enforcing the Federal CWA or the counterpart state law.[16]

Entergy's NPDES permit for the CWIS, which governs both the dumping of pollution into Cape Cod Bay and the withdrawal of cooling water, expired nineteen years ago.[17] The goal of the NPDES permit program is to get polluters to continually improve their CWIS technology and eventually reduce pollution to zero over time. See, Part II of this Report.

To meet this goal, EPA and MassDEP are supposed to review and update NPDES permits every five years to make sure the industry is using the "Best Technology Available" (BTA) to control environmental impacts. Since the state Clean Waters Act was in effect before the Federal CWA, Massachusetts first issued Pilgrim a NPDES permit in the 1970s and EPA issued Pilgrim's original permit around 1980. Entergy continues to use the same outdated technology that was allowed under those permits. Technologies and methods exist today that could entirely replace Entergy's CWIS[18] or at least mitigate some of the environmental damage and pollution from Pilgrim.

Entergy's NPDES permit contains no real "technology" requirements. Instead, it has inadequate conditions only requiring Entergy to **"self-monitor" the amount of water it uses, the volume, temperature, and amount of chemicals dumped into the Bay, and the numbers of marine organisms destroyed.**

EPA and MassDEP claim the legal power to "administratively extend" Entergy's expired NPDES permit, but the laws were never intended to allow a polluter like Entergy to continue operating for more than 19 years past the expiration date. A nuclear facility allowed to operate with an outdated CWIS system more than fifty years old that has little to no technology to mitigate Pilgrim's impacts to Cape Cod Bay undermines the purpose of the CWA NPDES program. Moreover, MassDEP and other state agencies have independent authority to enforce state laws to address Pilgrim's pollution and marine destruction, but they refuse to act.

In October 2012, residents issued a 'Notice of Intent to Sue' to Entergy, EPA, and MassDEP for violations of the CWA.[19] EPA and MassDEP responded by promising to renew the NPDES permit by December 2013. In January 2014, more than a year after

EPA and MassDEP reneged on this promise, local residents asked EPA to revoke Pilgrim's NPDES permit.[20] In February 2014, EPA responded to the residents' request saying the permit was being evaluated.[21] As of the date of this report, the NPDES permit has not been updated or renewed.

D. NRC Relicenses Pilgrim with Expired Clean Water Act NPDES Permit

In May, 2012 the NRC voted 3-1 to grant Entergy a license extension allowing Pilgrim to operate until 2032. Entergy's license extension application was challenged by numerous groups and the Massachusetts Attorney General. Jones River Watershed Association (JRWA) and Pilgrim Watch challenged the relicensing on the grounds that Entergy's expired NPDES permit (then 16 years expired) should be reissued before the license renewal, and Pilgrim's CWIS should be brought up to current standards. The NRC's appeal board rejected this challenge, but said,

> *"With respect to the long period of time – over sixteen years – that the 1994 NPDES permit for Pilgrim has administratively remained in effect after it was scheduled to expire in 1996, this would seem obviously to be a matter of concern,* ***and it is clearly to be hoped that EPA and Massachusetts (insofar as its action is required) will act as expeditiously as possible to resolve this state of affairs.*** *To the extent that the NRC Staff may appropriately choose to attempt to bring about some action in this regard, through interagency communication on matters of common or related concern, this would also seem to be beneficial and consistent with the purposes and goals of NEPA, other environmental statutes at issue, and NRC environmental regulations."*[22] (citations omitted; emphasis supplied)

NRC Commissioners voted to relicense Pilgrim despite the challenge to the NPDES permit (and other challenges, as described in Part II) was still pending. NRC Chairman Gregory Jaczko dissented, saying this was improper. Chairman Jaczko said,

> *"This hardly seems to be a fair process for the petitioners [JRWA and Pilgrim Watch]. Moreover, it appears to send a confusing message to the petitioners. On the one hand, by referring the petitions to the Board, the Commission appears to believe the petitions present at least some merit. On the other hand, by approving the staffs SECY paper the Commission appears to be saying there are no remaining initial matters of significance to resolve before the issuance of the license. If the Commission were so comfortable that the issues raised in the motion to reopen were trivial, the Commission could have simply dismissed them itself without referral to the Board."*[23]

In addition, Massachusetts State Senator Dan Wolf (D-Harwich) called the NRC's decision to relicense Pilgrim *"irresponsible, and irrational."*[24]

E. Entergy Destroys the Public's Natural Resources

Cape Cod Bay is a unique national treasure with an ecosystem that supports commercial and recreational fisheries, tourism, and recreation. The Bay has diverse habitats for variety of estuarine and marine species and communities, including fish, shellfish, turtles, marine mammals, plants, and birds. The Bay belongs to the public – not Entergy.

Federal and state laws are supposed to ensure that the public's rights to the Bay are protected from Entergy's industrial operations. Pilgrim's NPDES permit should not be used as a license for Energy to pollute and destroy the public's rights to the Bay's resources.[25]

Cape Cod Bay has a wide range of legal protections that are supposed to protect the public's rights in the Bay from Entergy's destructive operations. Under state law Cape Cod Bay is a protected "**ocean sanctuary**"[26] and is ranked as a "SA" water body, meaning it is an "excellent habitat for fish, other aquatic life and wildlife."[27] Entergy's CWIS operations prevent large portions of the Bay from achieving this standard of "excellent habitat."

Endangered species laws are supposed to protect certain species and their habitat in and around Cape Cod Bay. One of the world's most endangered marine mammals, the North Atlantic right whale (Figure 5), uses the Bay as an important feeding area and is frequently found near Pilgrim. There are only about 500 right whales left in the world, and much of Cape Cod Bay is designated "critical habitat" under federal law for the species. NOAA Fisheries has currently proposed to expand this designated area to include the entire Bay.[28]

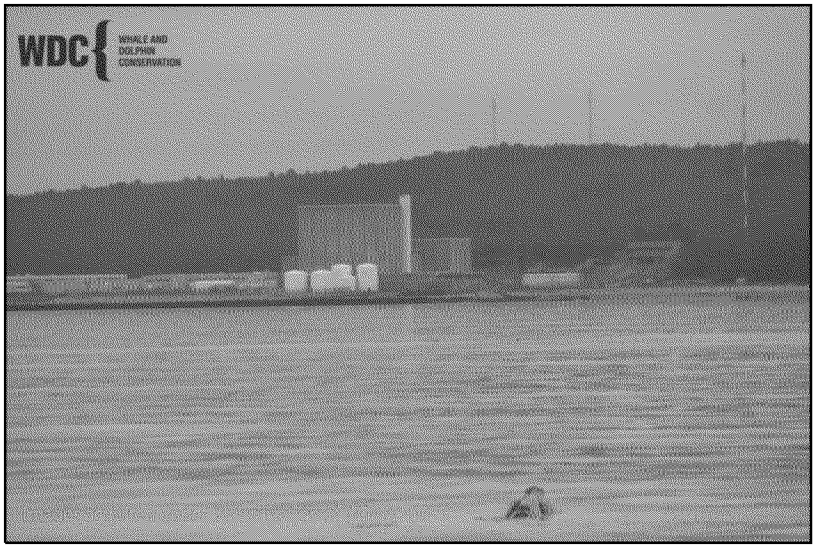


Figure 5. A North Atlantic right whale, nicknamed Wart (in foreground), was photographed in front of Pilgrim Nuclear Power Station (seen on shoreline) in 2013. Photo courtesy of WDC.

Protected bird species, including the endangered roseate tern, use the Bay and areas near Pilgrim for foraging and habitat. For more information on protected species, see Appendix, Part V.

Pilgrim also occupies public lands on Cape Cod Bay. Pilgrim's discharge channel, jetties, intake canal, and CWIS occupy the Bay itself (Figure 3). Under **Chapter 91, the state waterways law**, Entergy's use of these public tidelands in the Bay is allowed only if it serves a proper public purpose.[29] Yet MassDEP has not described that public purpose, although it has allowed these construction projects. MassDEP has granted Entergy Chapter 91 licenses for the discharge channel, jetties and intake canal, which are used for the CWIS and to dump pollution into the Bay. In 2015, MassDEP issued a determination to approve a new Chapter 91 waterways license for Entergy that also serves no proper public purpose and will result in further pollution of the Bay and interfere with the public's rights to use public resources. That license is currently the subject of a legal appeal.[30]

II. Overview of Relevant Laws

A. Clean Water Act NPDES Permit Requirements

The Federal CWA has two sections regulating Entergy's cooling water intake and discharge of pollution. These are known as Sections "316(a)" and "316(b)." EPA has primary authority for implementing the CWA in Massachusetts, but the state must sign off on NPDES permits. EPA and MassDEP are responsible for enforcing the NPDES permit, and the state has separate authority.[31]

1. CWA Section 316(a): Entergy's Thermal Pollution

Entergy's discharge of hot water requires a "thermal variance" under Section 316(a) because hot water is legally defined as a "pollutant." Entergy discharges hot water from two main sources: 1) up to 510 million gallons per day of condenser cooling water that can be up to 32□F hotter than the Bay's water, and a maximum of 102□F (Figure 6); and 2) up to 255 million gallons per day during periodic "thermal backwashes" that can be up to 120□F. Pilgrim's thermal backwash discharges contain biocides and chemicals Entergy uses to remove sea life such as mussels and seaweed that clog Pilgrim's screens and pipes (Figure 7).

During the period beginning Effective Date and lasting through Expiration Date, the permittee is authorized to discharge from outfall(s) serial number(s) 001, Condenser Cooling Water.

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency	Sample Type
Flow, MGD	447.0	510.0	Continuously*	Daily Avg. & Max.
Total Residual Oxidants (mg/l)	0.1	0.1	When in use	Grab
Temperature (Maximum), T_{Max}, °F	-	102	Continuously	Daily Max.
Temperature Rise (Maximum), Delta-T, °F**	-	32	Continuously	Daily

Figure 6. Pilgrim's NPDES permit allows Entergy to discharge water that is 32□F hotter than the Bay, with a daily maximum of 102□F. Permit, page 8.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency	Sample Type
Flow, MGD	-	255.0	When in use	Estimate*
Temperature (Maximum), °F	-	120	Continuous	Report Avg. and Max.

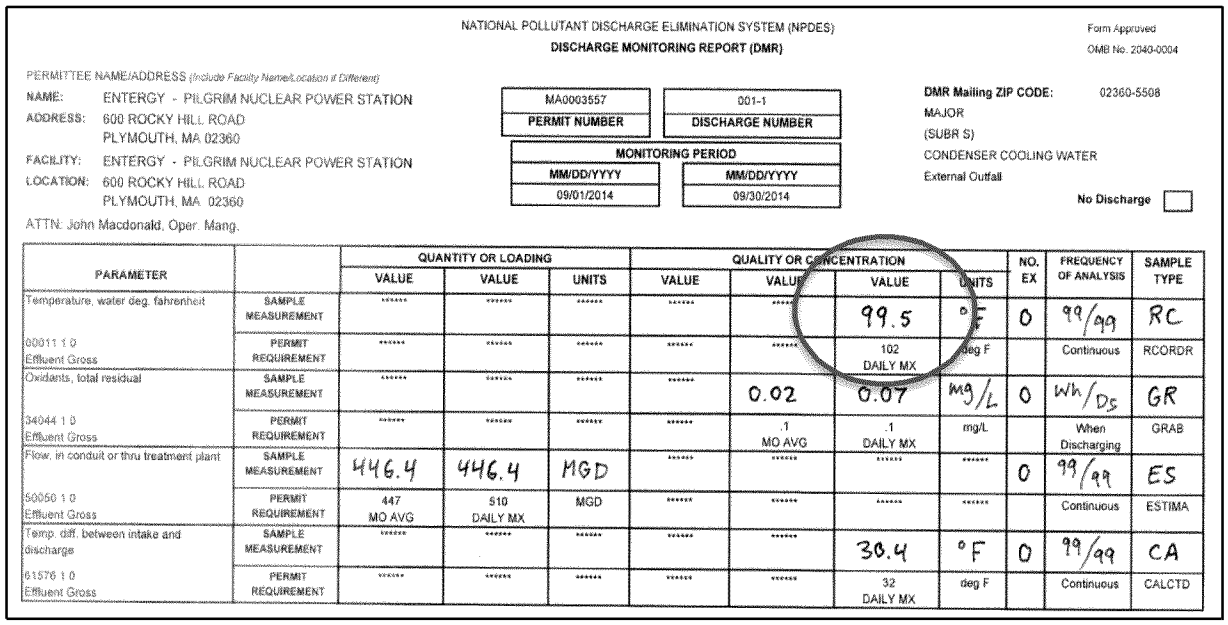
* Flow rate is to be estimated as if backflushing took place for 24 continuous hours.

The discharge shall not be more frequent than three hours a day twice a week for those periods when required the plant to operate most efficiently. Infrequent, abnormal environmental conditions may require this frequency to be doubled. These conditions will be described in the subsequent monthly DMR submittal.

Figure 7. Pilgrim's NPDES permit, page 9, allows Entergy to discharge water up to 120□F (daily maximum) for thermal backwash operations.

Pilgrim's NPDES permit requires Entergy to report the temperature of the hot water dumped into the Bay in monthly Discharge Monitoring Reports (DMRs). Entergy's own reports show temperatures reaching 99.5□F during routine operations and 108□F during thermal backwashes. See, examples below.

Example: In September 2014, the temperature of Pilgrim's cooling water discharge was 99.5□F (circled in red). Source: Entergy's DMR, Sept. 2014.



NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)
NAME: ENTERGY - PILGRIM NUCLEAR POWER STATION
ADDRESS: 600 ROCKY HILL ROAD
PLYMOUTH, MA 02360
FACILITY: ENTERGY - PILGRIM NUCLEAR POWER STATION
LOCATION: 600 ROCKY HILL ROAD
PLYMOUTH, MA 02360
ATTN: John Macdonald, Oper. Mang.

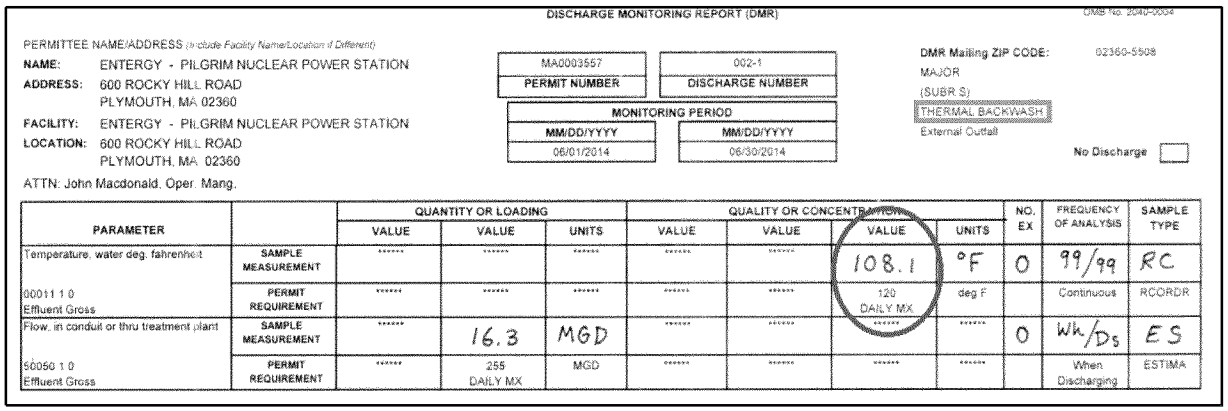
MA0003557	001-1
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	
MM/DD/YYYY	MM/DD/YYYY
09/01/2014	09/30/2014

DMR Mailing ZIP CODE: 02360-5508
MAJOR
(SUBR S)
CONDENSER COOLING WATER
External Outfall
No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Temperature, water deg. fahrenheit	SAMPLE MEASUREMENT	******	******	******	******	******	99.5	°F	0	99/99	RC
00011 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	102 DAILY MX	deg F		Continuous	RCORDR
Oxidants, total residual	SAMPLE MEASUREMENT	******	******	******	******	0.02	0.07	mg/L	0	Wh/Ds	GR
34044 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	.1 MO AVG	.1 DAILY MX	mg/L		When Discharging	GRAB
Flow, in conduit or thru treatment plant	SAMPLE MEASUREMENT	446.4	446.4	MGD	******	******	******	******	0	99/99	ES
50050 1 0 Effluent Gross	PERMIT REQUIREMENT	447 MO AVG	510 DAILY MX	MGD	******	******	******	******		Continuous	ESTIMA
Temp. diff. between intake and discharge	SAMPLE MEASUREMENT	******	******	******	******	******	30.4	°F	0	99/99	CA
61576 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	32 DAILY MX	deg F		Continuous	CALCTD

Example: In June 2014 the temperature Pilgrim's thermal backwash discharge was 108□F (circled in red). Source: Entergy DMR, June 2014.



DISCHARGE MONITORING REPORT (DMR)

OMB No. 2040-0004

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)
NAME: ENTERGY - PILGRIM NUCLEAR POWER STATION
ADDRESS: 600 ROCKY HILL ROAD
PLYMOUTH, MA 02360
FACILITY: ENTERGY - PILGRIM NUCLEAR POWER STATION
LOCATION: 600 ROCKY HILL ROAD
PLYMOUTH, MA 02360
ATTN: John Macdonald, Oper. Mang.

MA0003557	002-1
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	
MM/DD/YYYY	MM/DD/YYYY
06/01/2014	06/30/2014

DMR Mailing ZIP CODE: 02360-5508
MAJOR
(SUBR S)
THERMAL BACKWASH
External Outfall
No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Temperature, water deg. fahrenheit	SAMPLE MEASUREMENT	******	******	******	******	******	108.1	°F	0	99/99	RC
00011 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	120 DAILY MX	deg F		Continuous	RCORDR
Flow, in conduit or thru treatment plant	SAMPLE MEASUREMENT	******	16.3	MGD	******	******	******	******	0	Wh/Ds	ES
50050 1 0 Effluent Gross	PERMIT REQUIREMENT	******	255 DAILY MX	MGD	******	******	******	******		When Discharging	ESTIMA

Thermal pollution harms marine life and poses a serious threat to ecological health and individual species.[32] An average annual increase in water temperature of only about 1.8□F (1□C) can have significant effects on coastal marine community dynamics by impacting a variety of biological and ecological processes.[33]

Species such as krill and other plankton, cod, mackerel and lobster have been found to be particularly vulnerable to warming temperatures – populations tend to shift their ranges seeking more optimum water temperatures and become more susceptible to disease, disrupted predator-prey dynamics, and invasive species.[34] Marine ecosystems may be more sensitive to slight changes in temperature than terrestrial ecosystems, and only an optimal temperature range allows for successful reproduction and growth for most marine species – outside this optimal range mortality increases and fitness is reduced.[35]

To get a thermal variance in an NPDES permit under Section 316(a), the polluter is supposed to show that it can "**assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife...**"[36]

Entergy's current thermal variance is based on data from the 1960s and 1970s that Boston Edison used to get the original CWIS permit for Pilgrim. These studies were limited, are now outdated, and do not reflect changes in environmental conditions in the Bay. (As described below in Part III, the state opposed Boston Edison's once-through cooling CWIS, and it was only through a legal appeal that Boston Edison got the right to use the once-through system that Energy still uses today.)

Entergy's current NPDES is so flawed, it is impossible to determine the actual temperature of the hot water dumped in the Bay. Entergy reports the **average** temperature over a limited time period – over one hour and not throughout the entire day; thus, the water temperature could be greater than the maximum daily limit of 102□F outside that time period.[37]

The permit regulates the temperature via a maximum daily limit of 102□F (^{T}Max) and a maximum daily temperature rise of 32□F (Delta-T).[38] The temperature of the hot water discharged cannot exceed a differential of 32□F between the incoming water and the outgoing water. However, since Entergy merely reports an "average" it is unclear how monitoring results correlate with the NPDES permit limits. The NPDES permit (page 3) states,

> g. The rate of change of Discharge 001 Delta-T shall not exceed: (1) a 3 °F rise or fall in temperature for any 60-minute period during normal steady state plant operation and (2) a 10 °F rise or fall in temperature for any 60-minute period during normal load cycling. Variation in inlet temperature shall not be considered as an operational rise or fall of temperature. Normal startup temperature rise shall not exceed the maximum allowed in Subparagraph I.A.2.a below. In the event of a reactor emergency shutdown, the allowable decrease of 10° F/hour may be exceeded. In such an event, the permittee shall report the occurrence in the next monthly DMR to EPA and the State.
>
> h. The thermal plumes from the station:
>
> (1) shall not deleteriously interfere with the natural movements, reproductive cycles, or migratory pathways of the indigenous populations within the water body segment;
>
> (2) shall have minimal contact with the surrounding shorelines.

Entergy's routine discharge of hot water over the last 43 years has created an on-going "thermal plume" in the Bay. One study shows the thermal plume reaching nearly five square miles in size.[39] However, the plume size could be different because the study is based on limited field data. **There are no current data on the size of Pilgrim's thermal plume.**

Thermal pollution caused by Pilgrim's cooling system could be intensifying the effects of warming sea temperatures in Cape Cod Bay. From 1970 to 2002, sea surface temperature off the Massachusetts coast has increased by 2.3°F (1.3°C) between 1970 and 2002,[40] and Pilgrim continues to discharge approximately a half-billion gallons of heated effluent into the Bay every day. Cape Cod Bay is a semi-enclosed embayment, with about a 9% daily exchange rate between the Bay water and the Gulf of Maine ocean water.[41] A system such as Cape Cod Bay that is already being affected by thermal

pollution could potentially feel the effects of climate change (i.e., warming sea temperature) sooner and faster. For more information about Pilgrim's thermal plume, see Appendix, Part II.

The rising temperature of Cape Cod Bay's water has affected Pilgrim's mechanical components and can exceed design limits. This caused a reduction in power operations in 2013. The design temperature of Pilgrim's incoming cooling water from the Bay has to be 75□F or less.[42] In July 2013, incoming water exceeded this limit and Entergy was forced to reduce operations. The Millstone Nuclear Power Station in Connecticut also had to reduce operations when the temperature of its Long Island Sound cooling water rose above 75□F. Millstone sought NRC approval to increase the limit to 80□F, which was granted in 2013.[43] It stands to reason that equipment designed for cooler waters will be operating in more challenging and uncharted territory impacting efficiency and overall performance.

2. CWA Section 316(b): Entergy's Failure to Implement "BTA"

Section 316(b) requires the location, design, construction and capacity of Entergy's CWIS to reflect "BTA" for minimizing harm to the environment and ecosystems. Entergy's permit has no "technology" requirement, just a program of self-monitoring, as described in Part I(C) above.

In the 1970s, before Pilgrim was built, state regulators ordered Pilgrim's owner to install a closed-cycle cooling water system that would cause less environmental damage and comply with state laws. Boston Edison, Pilgrim's owner at that time, sued to prevent having to install a closed-cycle system, winning the case and installing the cheaper, more destructive once-through CWIS that Pilgrim still uses today.[44]

Pilgrim's failure to implement BTA causes massive environmental destruction through impingement, entrainment, thermal pollution, and scouring of the sea floor. Pilgrim's **impingement impacts** include twenty-one large impingement events, where 1,000 to 107,000 fish have been killed in, oftentimes, a matter of a few days. The marine species affected are part of the larger ecosystem of Cape Cod Bay, and impingement impacts extend far beyond the mere number of fish killed. See, Appendix Part I for more detail.

Pilgrim's massive, **ongoing entrainment of marine organisms** over the past 43 years has destroyed phytoplankton (the foundation of the marine food web), ichthyoplankton (fish eggs and larvae) and other zooplankton. Pilgrim entrains marine organisms every day that it operates by drawing them into the plant's industrial

systems. For **entrained zooplankton** at Pilgrim, experts assume 100% mortality, especially when the cooling water temperature at discharge exceeds 84.2□F (29□C) and coincides with chlorination.[45] Entergy's NPDES permit allows Pilgrim to continuously chlorinate each service water system.[46] It appears that this chlorinated water is mixed with the condenser discharge cooling water and a review of discharge monitoring reports from 2012-2014 shows that often the discharge temperature is above 84□F.[47] Thus, 100% of the zooplankton can be assumed to suffer mortality. For more on entrainment impacts see Appendix, Part II.

In 2000, regulators said, "there are reasons why we assume 100% lethality of **entrained ichthyoplankton**. This is assumed because in addition to the number of eggs and larvae killed during entrainment, there is no ability to measure long-term viability or success of surviving entrained organisms. Numerous studies have shown significant metabolic, behavioral, reproductive, and population sex ratio alterations from short duration exposures of eggs and larvae to moderately elevated water temperatures, and no known studies have examined the effects of cooling-water pressure and turbulence on organism viability. Short term survivability is no prediction of long term organism viability."[48] Thus, the impacts of Pilgrim's entrainment of ichthyoplankton likely have more widespread impacts than is reported.

Experts consider Entergy's **entrainment monitoring inadequate** and say the cumulative and ecosystem-wide impacts of entraining large numbers of fish eggs and larvae that would have otherwise grown into adults have been ignored. See Appendix, Parts II and III.

The force of Pilgrim's discharge and the high temperatures **harm bottom-dwelling, or benthic, communities** near Pilgrim. This can include crustaceans (e.g., barnacles, sand shrimp), mollusks (e.g., blue mussels, moon snails and other gastropods), echinoderms (e.g., sand dollars), and Irish moss (*Chondrus crispus*), a type of red algae. In particular, Irish moss was an important part of the benthic community along the shore in front of Pilgrim (Figure 8). Beginning in at least the 1880s, the Plymouth coastline was one of the major commercial Irish moss beds on the western Atlantic coast.[49] The moss was harvested for carrageenan, a thickening agent in food, and also used in the manufacturing and processing of toothpaste, cosmetics, milk, and other products. The harvest was once an important local economic driver in Plymouth, with annual commercial harvests once reaching a half-million pounds.

Today the Irish moss fishery is gone in Plymouth. It began declining in the early 1970s near Pilgrim, about the time the plant went online and began discharging thermal pollution, chorine, and scouring the seafloor.[50] Pilgrim's owners reimbursed at least one harvester for losses.[51] The sea floor impacted by Pilgrim is now denuded, sparse, and has stunted benthic zones, with significant impacts occurring 0.5-2.0 acres in size.[52]

Figure 8. Fishermen at the landing site on White Horse Beach, Plymouth at or near the Pilgrim site, with harvests of Irish moss. Irish moss, stored in collection nets, is being lifted out of the two boats. Source: Lawton R., et al.1992.

B. State's Failure to Use Water Quality Certification Authority

The Federal CWA gives MassDEP the power to make sure that any EPA NPDES permit meets state water quality standards.[53] If the permit does not comply with state standards, the state can veto it under the "Section 401 Water Quality Certification" of the CWA.[54] The current MassDEP's 401 Certification for Pilgrim NPDES permit was issued in 1994 – 21 years ago. Since then, MassDEP has done nothing to ensure that Entergy's operations do not violate the state water quality standards, including the standards for discharging radioactive materials into Cape Cod Bay, designated as top tier Class SA waters.[55]

During Pilgrim's relicensing, JRWA and Pilgrim Watch filed a legal challenge saying that the MassDEP 401 certification should be updated before the NRC renewed Pilgrim's

license.[56] On July 20, 2012, after Pilgrim was relicensed, the NRC appeal board denied this appeal as untimely, but noted that Entergy's effort to show compliance with state water quality standards was based on letters from state regulators sent to Boston Edison **"in 1970 and 1971** [that] indicated that the agencies were providing certain certifications relating to applicable water quality standards…and by relying on **its 1994 [NPDES] permit."**[57]

State water quality standards have become more protective of Cape Cod Bay since the 1970s. Yet, state agencies have wholly abrogated their duties to ensure Pilgrim's compliance with state water quality standards by letting the NRC relicense Pilgrim for another 20 years of "massive destruction" of marine resources. The state's failure to act and continued reliance on a § 401 water quality certification based on agency letters from 1970 and a 19-year old permit from 1994 is an outrage.

Unlike Massachusetts' failure to act, other states have taken their § 401 responsibilities seriously. During the NRC relicensing of Entergy's New York Indian Point and Vermont Yankee nuclear stations, state officials made legal appeals to assert the state's right to protect the public's interest in water quality from pollution and harm from those reactors.

In 2012 local residents asked the state to address Pilgrim's outdated § 401 certification, but this request has been ignored.[58]

C. Protected Species, Fisheries and Marine Mammal Protection Laws

State and federal laws protecting endangered and threatened species are intended to work in tandem with the CWA and the NRC's licensing process. The agencies that issue a permit or license must confer with the other agencies responsible for protecting listed species.

The NRC was required to consult with expert federal and state fisheries and wildlife agencies during Pilgrim's license extension that allowed continued operations from 2012 to 2032.[59] Yet, when the NRC did confer with the relevant agencies, those conferrals were based on inadequate information and resulted in challenges from local citizen groups. For example, groups challenged the NRC's failure to properly assess impacts on whales and fisheries.[60] As noted above, despite these challenges, the NRC approved the license extension. More details about these state and federal laws, and citizen efforts to ensure Pilgrim's compliance with them during the NRC operating license proceedings are described in the Appendix, Part IV.

1. Protected Species

The impacts of Pilgrim's thermal, chemical, and radiological pollution, as well as impingement and entrainment, on marine and terrestrial species protected under state and federal endangered species laws have not been adequately studied.

There are about 140 state-listed species in Cape Cod Bay or in the coastal areas adjacent to the Bay.[61] Eight federally endangered marine species, protected by the Endangered Species Act (ESA), have the potential to be in the immediate vicinity of Pilgrim: four sea turtles, three whales, and the Atlantic sturgeon.

The North Atlantic right whale (*Eubalaena glacialis*) is one of the rarest large whales.[62] Cape Cod Bay is currently one of four critical habitat areas for right whales in the Gulf of Maine.[63] Right whales use Cape Cod Bay primarily during winter and spring to feed, socialize and nurse calves, although individuals can be found in Cape Cod Bay year round.[64] In January 2013, a mother-calf right whale pair were documented within the 500 yard security exclusion zone in front of Pilgrim – the first mother-calf sighting in Cape Cod Bay in January in nearly thirty years, and the first sighting of a mother-calf pair so close to Pilgrim.[65] See also, Part I(E) above.

Many of the marine organisms entrained and impinged in Pilgrim's CWIS are important food sources for whales. For example, humpback and minke whales will commonly feed on schooling fish that are impinged by Pilgrim (e.g., Atlantic herring and sand lance). Right whales feed on planktonic species (e.g., copepods) that are likely being entrained by Pilgrim – but Entergy's self-monitoring program is inadequate and does not consider the impacts of Pilgrim's entrainment on the food chain. Entergy is not required to monitor and report entrainment rates for copepods and other planktonic resources important to whales. The importance of copepods to right whales has been addressed by Dr. Stormy Mayo, a leading expert on right whales. He said,

"In Cape Cod Bay it's very clear that right whale distribution and occurrence is keyed directly to the plankton resources, principally composed of copepods, and that, of course, the health of the population depends on the quality and quantity of the food that the whales obtain in all of their few known critical feeding habitats areas of which one is Cape Cod Bay."[66]

-- Dr. Stormy Mayo, Center for Coastal Studies, Provincetown, MA 2012

Yet, Entergy is allowed to destroy copepods and other planktonic species important to whales, without having to monitor the impacts.

Protected birds are also likely impacted by Pilgrim's operations due to impingement and entrainment of their food supply. For example, the endangered roseate tern is threatened by Pilgrim's destruction of small marine fish, such as blueback herring and Atlantic menhaden, which are regularly impinged at Pilgrim in high numbers. See Appendix, Part IV.

"If [Pilgrim] is relicensed and continues to operate for twenty more years, there is significant potential for adverse effects on roseate terns throughout that period."[67]
-- Dr. Ian Nisbet, world renowned ornithologist, 2012

2. Fisheries Conservation

Certain areas in Cape Cod Bay have been designated "Essential Fish Habitat" (EFH) and are legally protected under the Federal **Magnuson-Stevens Fishery Conservation and Management Act** (Magnuson-Stevens Act).[68] The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) is responsible for implementing the law.

The Magnuson-Stevens Act identifies offshore, migratory, bottom dwelling and anadromous fish, like those impinged and entrained at Pilgrim, as "valuable and renewable natural resources" to be conserved and managed to prevent further destruction of the species.

Pilgrim routinely impacts more than 90 species of fish – oftentimes overfished, prohibited and protected species. EFH has been designated in the Bay for a number of federally managed species, including winter flounder, Atlantic cod, windowpane flounder, red hake, blue fin tuna, and white hake.[69] The NRC recognized thirty-two species with EFH designated in the vicinity of Pilgrim.

During Pilgrim's relicensing, the NRC was required to consult with NOAA Fisheries under the Magnuson-Stevens Act to ensure Pilgrim's continued operations did not further harm fish and their habitats. In this process, NOAA Fisheries identified several adverse impacts from Pilgrim on EFH, protected species, and other public trust resources. NOAA Fisheries told the NRC that Entergy's self-monitoring of impacts from entrainment failed

to adequately address the overall ecosystem and food web impacts from the CWIS.[70] NOAA Fisheries stated,

> As described within the 2001 draft EFH assessment, the NRC utilizes the "adult equivalent" analysis in order to determine relative impact of the facility on fishery resources. However, this method focuses solely on finfish survival to maturity and does not account for ecosystem and food web benefits resulting from egg and larval predation. In order to fully account for adverse impacts resulting from the facility, the proposed assessment should include an analysis of ecosystem and food web benefits foregone as a result of operational impacts on eggs and larvae.

The "analysis of ecosystem and food web benefits foregone as a result of operational impacts on eggs and larvae" was never done, and the NRC relicensed Pilgrim anyway.

NOAA Fisheries also said:

> **Thermal discharges**
> The Pilgrim Nuclear Power Station is currently authorized to discharge heated effluent into Plymouth Bay. As stated within the 2001 draft EFH assessment, discharge temperature differentials ranging from 33.8 - 48 degrees Fahrenheit have been found to occur in an area of up to 1.17 acres. Adverse impacts on fishery resources and EFH resulting from the thermal plume within this "mixing zone" should be detailed within the EFH assessment.

This thermal plume assessment was also never done. For more information, see Appendix, Part III.

Winter flounder (*Pseudopleuronectes americanus*) are protected under the Magnuson-Stevens Act, and is a species of recreational and commercial importance in Cape Cod Bay. The area near Pilgrim is a nursery and feeding ground for winter flounder. Pilgrim's CWIS negatively impacts this species and its habitat. Entergy's own reports provide examples of the extent of destruction caused by entrainment and impingement. In 1997 and 1998, by entraining winter flounder larvae in Pilgrim's CWIS, as many as 124,000 equivalent adult fish were killed.[71] When converted to pounds of fish taken, this is about 40% of the annual total recreational and commercial catch in the area. In 1998, one of the highest records of larval winter flounder entrainment occurred when 77,000 equivalent adults were entrained, which was nearly a 30% loss of the adult population that year.[72]

This destruction does not go unnoticed by regulators, **yet since the Pilgrim Administrative-Technical Committee** (PATC; also referred to as the Pilgrim Technical Advisory Committee) **was disbanded in 2000, nothing is done about it**. Entergy's NPDES permit allows Entergy to **merely study** the winter flounder population, and additional monitoring efforts are non-existent for other important and declining species. Were the PATC still active, it is a virtual certainty that at least rainbow smelt and river herring would have extensive monitoring efforts similar to that of winter flounder. For decades, regulators have stood by and watched Entergy "study" only limited marine destruction caused by the CWIS, and not monitor impacts to the ecosystem and wider impacts. For more information see Appendix, Part III.

Studies of Pilgrim's impacts of entrained larvae began in the mid-1970s. More studies such area-swept trawls, larval-to-larval studies, and tag and release programs are done to provide the illusion that marine resources are being protected.

Many of Entergy's studies under the NPDES have focused on winter flounder due to its importance as a recreational and commercial fishery. Entergy's own reports show the damage to winter flounder, yet in 2000 and 2001 Entergy asked EPA and MassDEP for permission to discontinue its winter flounder "area-swept" trawl study.[73] EPA denied Entergy's request, stating,

> *"After consultation with state and federal scientists, the [EPA] and [MassDEP] agree that winter flounder area-swept population estimates are a necessary component of the flounder assessment program. . .EPA and MassDEP require that Entergy continue the winter flounder area swept population estimates as part of the ongoing [Pilgrim] winter flounder impact assessment. . .We feel that continuity of this biological monitoring is a necessary mechanism by which the regulatory agencies can detect and assess the magnitude of environmental impacts from once-through cooling water systems."*[74]

Rainbow smelt (*Osmerus mordax*) have also been the subject of study by Entergy and regulators themselves. Pilgrim routinely impacts smelt – both through impingement and entrainment. The Jones River in Kingston, Massachusetts was once one of the largest smelt runs in the state. The fish use the river for spawning and then return to Cape Cod Bay and swim along the coast, including past Pilgrim where they may become impinged or entrained. These are a schooling fish historically common along the coast of Massachusetts, and are valuable to recreational fishing, small-scale commercial fisheries and as an important food source to other wildlife.

In the late 1970s, an estimated 6,200 smelt were impinged at Pilgrim in a three-week period, raising serious concerns that the impacts could be significantly affecting the

population in the Jones River. In response to Pilgrim's destruction of rainbow smelt, Boston Edison was required to sponsor a study (1979-1981) of the Jones River smelt run[75] with the goal of assessing and increasing production of the population in the Jones River, and to compensate for mortalities caused by Pilgrim's CWIS.

This study has done nothing to prevent the decline of local populations of rainbow smelt in the Jones River and other places. In 2004 the federal government listed rainbow smelt as "species of concern"[76] under the Federal ESA.[77]

Due to the discontinuance of the PATC in 2000 (see section IV.1 below), Entergy no longer carries out rainbow smelt studies, but Pilgrim continues to impinge and entrain them with impunity. One study estimates that more than 1,300,000 rainbow smelt are killed each year by Entergy's operation of Pilgrim.[78]

3. Marine Mammal Protection Act

The **Marine Mammal Protection Act of 1972** protects all marine mammal species in Cape Cod Bay near Pilgrim, such as minke whales, gray seals, harbor seals, harbor porpoises, and Atlantic white-sided dolphins (Figure 9). Pilgrim's pollution and destruction of marine resources since 1972 has been destroying their habitats and food supply.

Figure 9. Harbor seals off Manomet Point Road near Pilgrim, Plymouth, MA. Photo: C. Bostek

4. Coastal Zone Management Act

Massachusetts has an important role to play in protecting Cape Cod Bay under the Federal **Coastal Zone Management Act** (CZMA). This law establishes a national policy to "preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations." It is designed to "encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone...."[79] Massachusetts' Office of Coastal Zone Management (MassCZM) office implements this law and coastal policy for the state.

During Pilgrim's relicensing, MassCZM was required to certify that the continued operation of Pilgrim from 2012 to 2032 would be "consistent" with all policies and laws that protect the coastal zone, including the state Clean Waters Act and water quality standards.[80] Despite Pilgrim's expired NPDES permit that allowed the continued use of Pilgrim's outdated CWIS, MassCZM issued a consistency certification.

The 2006 eight-line "certification" mysteriously contradicted MassCZM's own June 27, 2000 letter to EPA describing major issues of Entergy's non-compliance with environmental laws and concerns about ecosystem impacts from the CWIS.[81] Between 2000 and 2006, Entergy did nothing to mitigate the impacts or address MassCZM's concerns. Instead, Entergy' uprated Pilgrim so that it increased its power output, and increased the frequency and duration of operations, meaning it used more water and caused more damage than in years prior.

During Pilgrim's NRC relicensing, JRWA and Pilgrim Watch filed a challenge seeking to require an updated MassCZM consistency certification before the operating license was renewed.[82] The NRC appeal board denied this appeal.

In April 2012, members of the public asked MassCZM to conduct a supplemental review of its flawed 2006 certification.[83] MassCZM replied that it would not reconsider. On June 15, 2012, the groups replied to MassCZM stating:

> *"A marked reluctance to make any thoughtful or independent statement about the environmental impacts of PNPS relicensing permeates MCZM and MassDEP's historic and present dealings with PNPS owners and operators. This is despite the fact that two federal statutes explicitly express the duty, as well as the right, of states to impose their own standards on all projects, including nuclear facilities, in the coastal zone. See, 16 USCS § 1452(1), (2), and § 1456(f). These duties exist independent of, and are unaffected by, the fact that PNPS is a nuclear facility that is also subject to federal laws.* ***MCZM's failure to require supplemental coordination is but another abdication of the state's independent and essential environmental review duties, intended to protect its citizens and resources, which we continue to document. MCZM's actions are arbitrary, capricious and an abuse of discretion, or otherwise not in accordance with law."***

To date, MassCZM has done nothing to ensure that Pilgrim complies with the state's policies, which it certainly does not.

III. Entergy Fights Environmental Laws

Pilgrim's past and present owners have a long track record of fighting CWA requirements that would have prevented some of Pilgrim's destruction of marine life and pollution. As discussed in Section II.A.2, in the 1970s Pilgrim's owner filed a legal challenge over the state's requirement for a "closed-loop" cooling water system that would use less water and cause less destruction and pollution, eventually prevailing.[84]

In 2011 Entergy sued MassDEP in attempt to stop implementation of new CWIS regulations that would put stricter conditions on Pilgrim's operations. Entergy lost the case and Massachusetts' highest court said,

> *"[t]he environmental impact of these systems [Entergy's once-through CWIS] is staggering, . . . destabilizing wildlife populations in the surrounding ecosystem. In areas with a designated use as aquatic habitat (such as Cape Cod Bay where Pilgrim's CWIS operates), therefore, CWIS hinder the attainment of water quality standards. . ."*[85]

Entergy continues to fight with EPA and MassDEP to avoid new CWIS technology improvements. See, for example Entergy's Feb. 16, 2002 letter to EPA challenging an EPA report that identifies 13 alternate technologies that could be used to reduce impingement and entrainment of marine life at Pilgrim. Entergy claims Pilgrim's operations "have not created and are not likely to create an adverse environmental impact" to the ecosystem, and rejects any technology updates. As shown in this report, Entergy's claims are unfounded.

In 2014, Entergy argued to EPA that "nuclear safety" concerns mean Entergy cannot improve the CWIS.[86]

IV. Regulators Roll Back NPDES Permit Conditions While Agency Staff Criticizes Pilgrim's CWIS Operations

Instead of requiring continuous improvements over time to Pilgrim's CWIS as required by the CWA, EPA and MassDEP have allowed Entergy to get away with more and more destruction and have *weakened*, not strengthened the NDPES permit. There are at least seven ways the permit has been weakened over time.

1. PATC oversight committee was disbanded in 2000.

   The cornerstone of Pilgrim's NPDES permit is the requirement for a scientific panel, the PATC, to oversee Pilgrim's impacts and recommend technology improvements or mitigation. The PATC was disbanded in early 2000, shortly after Entergy bought Pilgrim. This is in violation of Pilgrim's permit, which says Entergy must "*carry out the monitoring program under the guidance of the Pilgrim Technical Advisory Committee.*"

   From the 1980s until it was disbanded in 2000, the PATC met several times per year, issued reports, and regularly expressed serious concerns about Pilgrim's CWIS. Examples of PATC reports are contained in Appendix, Part III. Since the PATC disbanded, there has been no regulatory oversight of Pilgrim's operations in the manner required by the NPDES permit. Entergy simply files its "self-monitoring" reports, which are biased and use flawed methodologies. There are no consequences for fish kills, dumping massive amounts of hot water into Cape Cod Bay year after year, and causing other types of marine destruction and pollution. Further, there is no information about the cumulative impacts of Pilgrim's environmental damage, a concern raised repeatedly by state and federal regulators. See Appendix, Part III.

2. Entergy ended aerial surveys in 1993. These surveys looked for schools of migrating fish so Pilgrim could shut down the intake pumps to avoid impinging and entraining them.[87]

3. Entergy is no longer coordinating refueling and maintenance shut downs with times when there are high concentrations of winter flounder eggs and larvae in the water to avoid entrainment. There is no record that Energy has ever fully observed PATC's recommendations to coordinate Pilgrim's planned refueling outages or to use "alternate cooling" during the last two weeks of April until the end of May to "coincide with the peak densities of winter flounder larvae in the water column."[88] While Pilgrim's scheduled refueling outages sometimes overlap with the months of April and May, the outages do not fully follow the PATC's recommendation (last two weeks of April and throughout May). In years when refueling does not occur, Entergy does not use an alternate cooling system as recommended during this timeframe, despite the potential impacts to winter flounder and other migrating and threatened species like smelt and river herring.

4. Entergy is not using methods to protect fish from "gas bubble disease" caused by saturated levels of total dissolved gas (including nitrogen) in the discharge canal.[89]

5. Entergy stopped funding mitigation projects. In the past, Boston Edison, and later Entergy, was required to fund mitigation projects in an effort to offset Pilgrim's destructive marine ecosystem impacts.[90] Soon after Entergy bought Pilgrim, most of the restoration projects ceased.

6. Entergy ended marine monitoring of the "benthic" or sea floor habitat in front of Pilgrim.[91] The last benthic survey was done in 1999, the year Entergy bought Pilgrim.

7. EPA and MassDEP gave Entergy permission to dump another pollutant into the Bay. EPA has unlawfully "amended" the NPDES permit to let Entergy dump the chemical tolyltriazole, a corrosion inhibitor, into Cape Cod Bay.[92]

While the regulatory agencies have failed to act to renew Entergy's long-expired NPDES permit, Entergy's destruction of the ecosystem has not gone unnoticed by some state and federal regulators. Citizens have reviewed thousands of pages of documents from government agencies, including many produced by Entergy itself, documenting the scope and scale of Pilgrim's destruction of the marine ecosystem over the past 43 years. In some of these records, agency staff point out defects in Entergy's marine studies and expose the charade of Entergy's self-monitoring. Examples are contained in the Appendix, Part III.

Some of the most significant agency criticisms include:

- Regarding the NRC's use of "adult equivalent" (EA) analysis to determine relative impact of Pilgrim on fisheries resources, NOAA Fisheries states "this method focuses solely on finfish survival to maturity and does not account for ecosystem and food web benefits resulting from egg and larval predation. In order to fully account for adverse impacts resulting from the facility, the proposed assessment should include an analysis of the ecosystem and food web benefits foregone as a result of operational impacts on eggs and larvae."[93]

- Entergy's self-monitoring "does not provide sufficient scientific evidence to state unequivocally that the entrainment of fish larvae and eggs does not constitute a long-term adverse impact to the food web comprised of the collective populations of species within Cape Cod Bay."[94]

- Entergy has failed to continue the past practice of "scheduled re-fueling and/or maintenance outages…in April and May to coincide with the peak densities of winter flounder larvae in the water column." In 1998, the PATC recommended that EPA and MassDEP request Pilgrim shut down in the spring to avoid destruction of winter flounder during spawning season.[95] Entergy replied that it was "complicated" and it never happened. The request was made because 1998 entrainment numbers were extremely high (even greater than 1997, the previous time-series high.

- There are "large-scale fish kills, which have occurred at the facility as a direct result of the discharge (e.g., in 1973 an estimated 43,000 menhaden died from gas bubble disease), the interruption of the fall migration of those species that are attracted to the thermal plume (e.g., striped bass) and the potential for thermal shock to the later in the event of an outage."[96]

- Entergy's mitigation of damage is insufficient and it should "take a more active approach" to minimize impingement, entrainment, and thermal impacts to "ensure against significant cumulative impacts," including shutting down during certain times of the year.[97]

V. Conclusion

For the past 43 years — from 1972 to the present — the daily operation of Pilgrim has been destroying and polluting Cape Cod Bay. The expired NPDES permit and the failure of state and federal regulators to enforce existing laws or implement them **in a way that protects the public and the environment,** reveals that regulatory programs intended to protect public resources are wholly inadequate. The 19-year old, expired CWA NPDES permit combined with flawed and inadequate consultations of federal agencies under the Endangered Species Act, the Magnuson-Stevens Act, and Coastal Zone Management Act, together with the on-going failure of MassDEP and MassCZM to effectively do their jobs demonstrates that the only solution to protect public and environmental resources is to terminate Pilgrim's NPDES permit.

The environmental laws that authorize agencies to issue permits to polluters were never intended to allow Entergy to use Cape Cod Bay as a source of free cooling water and a dumping ground for its toxic pollution and radioactive waste. Entergy violates the spirit and intent of the CWA by using outdated technology under an expired permit that has been weakened to only require "self-monitoring" and "study" of marine destruction. It is time for public agencies to stand up for public rights, terminate the NPDES permit and start restoring public trust resources.

Notes and Citations

[1] Pilgrim reportedly kills an estimated annual average of 14.5 million fish and 160 billion blue mussels; Stratus Consulting. 2002. *Habitat-based replacement costs: An ecological valuation of the benefits of minimizing impingement and entrainment at the cooling water intake structure of the Pilgrim Power Generating Station in Plymouth, Massachusetts*. Report for U.S. EPA, Region 1. 133 pp.; This study looked at fish and mussels using 1974-1999 data, and age-1 equivalent losses.

[2] Maurer W. and Boyle B. 2015. *PNPS Efficiency Review*. <http://www.capecodbaywatch.org/2015/05/pilgrim-efficiency-study/>

[3] Entergy is an affiliate of Entergy Nuclear Operations, Inc., a Louisiana-based corporation with annual revenues of about US$11 billion in 2013. Wikinvest. Entergy stock statement. <http://www.wikinvest.com/stock/Entergy_%28ETR%29/Data/Income_Statement#Income_Statement>

[4] For more information, see *How it works: water for power plant cooling*, Union of Concerned Scientists. <http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-cooling-power-plant.html#.VT5qeCvF9bI>; Pilgrim Watch. 2014. *Pilgrim Risks: Accidents and Daily Operations*.

Pilgrim's use of large volumes of water for its operations is essentially the same method of power generation used at a fossil fuel plant. That is why power plants - nuclear or coal - are located on large bodies of water, such as rivers, lakes, or the ocean: they need water to remove waste heat. Instead of burning fossil fuels such as coal or natural gas to make steam, Pilgrim splits atoms that are contained in pellets of uranium. Pilgrim also uses the Town of Plymouth's municipal water supply. From 2003 to 2013, Pilgrim's use made up about 2.5-9.0% of the total amount of water used by the Town of Plymouth: about 1.6B to 1.8B gallons per year. *Source:* Town of Plymouth, Water Division. 2014.

[5] Maurer W. and Boyle B. 2015. *PNPS Efficiency Review*. <http://www.capecodbaywatch.org/2015/05/pilgrim-efficiency-study/>

[6] New York Times. 1988. *Restart approved at nuclear plant.* <http://www.nytimes.com/1988/09/13/us/restart-approved-at-nuclear-plant.html>; U.S. Committee on Labor and Human Resources. 1988. *Hearing before the Committee on Labor and Human Resources United States Senate on Restart of the Pilgrim I Nuclear Power Plant.* Plymouth, MA. 876 pp.

[7] *Nuclear power in an age of uncertainty*. 1984. Washington, D.C.: U.S. Congress, Office of Technology Assessment, OTA-E-216. <http://govinfo.library.unt.edu/ota/Ota_4/DATA/1984/8421.PDF>

[8] New York Times. 1989. *Pilgrim reactor started after 3-year shut down.* <http://www.nytimes.com/1989/01/01/us/pilgrim-reactor-restarted-after-3-year-shutdown.html>

[9] In addition to operating Pilgrim, Entergy has an Independent Spent Fuel Storage Installation (ISFSI) at Pilgrim for storing high-level nuclear waste nuclear waste on site indefinitely. Entergy began building this "dry cask" facility in 2012. Some of the 42 years' worth of nuclear waste was moved to dry casks in early 2015. Entergy's failure to comply with local zoning for the facility is currently the subject of a legal appeal. See: <http://www.capecodbaywatch.org/2015/04/land-court-zoning-lawsuit-one-step-closer-to-trial/>

[10] Cape Cod Times. Nov. 9, 2013. *NRC boss: Pilgrim headed for trouble.*

[11] Power Engineering. Jan. 9, 2014. *NRC lowers Pilgrim nuclear plant performance to "degraded."* <*http://www.power-eng.com/articles/2014/01/nrc-lowers-pilgrim-nuclear-plant-performance-to-degraded.html*>; Cape Cod Times. Mar. 18, 2015. *Activists, supporters sound off on Pilgrim nuclear plant.* <http://www.capecodonline.com/article/20150318/NEWS/150319382/?Start=1>

[12] Gunter L., Gunter P., Cullen S., and N. Burton. 2001. *Licensed to Kill: How the nuclear power industry destroys endangered marine wildlife and ocean habitat to save money.* <http://www.beyondnuclear.org/licensed-to-kill/>

[13] Hanson C.H., White J.R., and H.W. Li. Oct. 1977. *Entrapment and impingement of fishes by power plant cooling-water intakes: an overview.* Marine Fisheries Review. 11 pp.

[14] Stressful conditions can result in increases lactic acid in tissues leading to muscle fatigue and suffocation; Dominy C.L. 1971. *Changes in blood lactic acid concentrations in alewives (Alosa pseudoharengus) during passage through a pool and weir fishway*. J. Fish. Res. Board Can. 28: 1215-1217.

[15] Radioactive toxins are deliberately/accidentally released from power plants into water sources (Beyond Nuclear. Apr. 2010. *Leak First, Fix Later*. p. 5); "Liquid radioactivity is released from PNPS to Cape Cod Bay via the circulating water discharge canal. These effluents enter Cape Cod Bay at the outfall of the canal, which is located about 1100 feet north of the reactor building."(PNPS, Radioactive Effluent and Waste Disposal Report. Jan. 1-Dec. 31, 2000. Section 2.3.); In 2013, Pilgrim discharged radioactive toxins including cromium-51, manganese-54, iron-55, iron-59, cobalt-50, cobalt-58, cobalt-60, zinc-65, zirconium/niobium-95, molybdenum/technetium-99, silver-110M, antimony-124, cesium-137. (Entergy Annual Report 2013. Table 2.3-B, Batch Mode Releases); Pilgrim also leaks a range of toxins into soil/groundwater. (Entergy Annual Report 2013. p. 70.)

The NPDES permit does not regulate Entergy's discharge of radioactivity to the Bay. State law controls discharges, but MassDEP has ignored its responsibility to ensure Entergy meets water quality standards for radioactive substances set forth in 314 CMR 4.0 (5)(d). These releases are only subject to "self-reporting" by Entergy to NRC, which merely sets "acceptable limits" for discharging radioactive toxins. Limits are based on harm to humans (and are inadequate in any event.) Even if Entergy meets NRC's "acceptable limits," the radioactivity may be harming the environment or marine resources. Testing marine life for cumulative impacts and concentrations of Entergy's radioactive toxins has been inadequate or non-existent.

[16] The Federal Water Pollution Control Act was first passed in 1972 and is known as the "Clean Water Act." 33 U.S.C. § 1311, 1312, 1341 and 1342. Massachusetts has had water pollution control laws on the books since the 1960s. The current state law is known as the "Clean Waters Act." Mass. General Laws, Chapter 21, Sections 26-53.

[17] Pilgrim 1991 NPDES permit.

[18] For example, see a Jul. 2013 study of closed-cycle cooling options for the Diablo Canyon Nuclear Plant in California. Bechtel Power Corporation. 2013. Final Technologies Assessment for the Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for Diablo Canyon Power Plant (Draft). Report No. 25762-0003H-G01G-0001.

[19] The Notice of Intent to Sue under the Clean Water Act identified 33,000 violations at Pilgrim. Entergy responded by threatening to sue the residents. When MassDEP and EPA promised to renew the NPDES permit by Dec. 2013, the residents put the lawsuit on hold. See, Notice of Intent to Sue under the Clean Water Act, Oct. 5, 2012. Residents also sent MassDEP a notice of damage to the environment under to MassDEP alleging violations of the state Clean Waters Act and Article 97 of the Mass. Constitution which provides the right to clean water and environment. See, Oct. 5, 2012 letter to MassDEP.

[20] Letter to U.S. EPA from Cape Cod Bay Watch, Jan. 28, 2014. Re: Re: Pilgrim Nuclear Power Station, Plymouth, Massachusetts: Expired Clean Water Act NPDES Permit No. MA0003557.

[21] Letter to Cape Cod Bay Watch from U.S. EPA, Feb. 27, 2014. Re: Pilgrim Nuclear Power Station (No. MA0003557), Request for Permit Termination.

[22] ASLB Order, LBP -12-16, July 20, 2012, p. 20, footnote 76.

[23] NRC Voting Record. 2012. Renewal of full-power operating license for Pilgrim Nuclear Power Station.

[24] Simckowitz J. 2012. *Senator Wolf decries relicensing of Pilgrim Nuclear Plant.* (press release) Barnstable-Hyannis Patch.

[25] 1994 modification to Pilgrim's 1991 NPDES permit, Part II, Section A, Part 6 (p. 3). (The permit does not "[d]oes not convey any property rights of any sort, or any exclusive privilege.")

[26] This law prohibits "dumping or discharge of …industrial wastes" is prohibited except under certain circumstances that do not apply to Pilgrim. Mass. General Laws, Chapter 132A, Section 15(4) and Section 13.

[27] Mass. Surface Water Quality Standards, 314 Code Mass. Regulations, Part 4.00, Section 4.05(4)(a).

[28] NOAA Fisheries. Feb. 13, 2015. Press release: *NOAA proposes to expand critical habitat for endangered North Atlantic right whales.* <*http://www.nmfs.noaa.gov/mediacenter/2015/02/13_02_rightwhalecriticalhabitat.html*>

[29] 310 CMR 9.00; Also see: Cape Cod Bay Watch. 2015. New Project at Pilgrim Threatens the Safety of Our Families, Homes, and the Environment. <http://www.capecodbaywatch.org/2014/10/entergys-waterways-application-state-grants-hearing-to-citizens/>

[30] Cape Cod Bay Watch. 2015. *History of Tidelands.* <http://www.capecodbaywatch.org/2015/04/history-of-tidelands/>

[31] Mass. General Laws, Chapter 21, Sections 26-53.

[32] Azmi S., et al. 2015. *Monitoring and trend mapping of sea surface temperature (SST) from MODIS data: a case study of Mumbai coast*. Environmental Monitoring and Assessment. 187:165; Oviatt C.A. 2004. *The changing ecology of temperate coastal waters during a warming trend*. Estuaries. (27)6: 895-904.

[33] Including metabolic rates, population growth, distribution and abundance of prey, including phenology and productivity, and population connectivity; Oviatt C.A. 2004. *The changing ecology of temperate coastal waters during a warming trend.* Estuaries. (27)6: 895-904.; Hoegh-Guldberg O., et al. 2010. *The impact of climate change on the world's marine ecosystems*. Science. (328): 1523-1528.

[34] WCAI. 2012. *Cape change: A local perspective on global warming.* <http://www.wgbh.org/wcai/change.cfm>; National Geographic. 1996-2012. *Sea temperature rise: Warmer oceans have far-reaching effects*. <http://ocean.nationalgeographic.com/ocean/critical-issues-sea-temperature-rise/>; Oviatt C.A. 2004. *The changing ecology of temperate coastal waters during a warming trend*. Estuaries. (27)6: 895-904.

[35] Hoegh-Guldberg O., et al. 2010. *The impact of climate change on the world's marine ecosystems*. Science. (328): 1523-1528.

[36] Section 316 of the Federal Water Pollution Control Act of 1972, 33 U.S.C. § 1251 et seq.

[37] Pilgrim Watch. 2014. *Pilgrim Risks: Accidents and Daily Operations. p. 45,* Marine Impact.

[38] Pilgrim's 1991 NPDES Permit No. MA0003557, p. 6.

[39] 3,000 acres, up to 1□C Δ; Entergy. 2000. Pilgrim Nuclear Power Station Supplemental §316 Demonstration Report.

[40] EEA and the Adaptation Advisory Committee. 2011. Massachusetts climate change adaptation report. 128 pp.

[41] CCS. 2014. *Cape Cod Bay*. <http://coastalstudies.org/cape-cod-bay/>

[42] NRC. Jul. 16-17, 2013 Event Reports.

[43] In Jul. 2013, the NRC approved Millstone unit 3 to use water as warm as 80□F, up from 75□F. The agency approved a similar request for the Millstone unit 2 in Apr. 2013.

[44] Personal communication from Robert Brown, Attorney, MassDEP.

[45] This does not include mechanical damage. Bridges W.L. and R.D. Anderson. *A brief survey of Pilgrim Nuclear Power Plant effects upon the marine aquatic environment.* In: *Observations on the ecology and biology of western Cape Cod Bay, Massachusetts.* 1984. Eds, Davis, J.D. and D. Merriman. Springer-Verlag, p. 65-76.

[46] Permit No. MA 003557, A.1.(a)(2)

[47] For example, in Jun. 2011, the temperature was 97.7□F (36.5□C) and in Jul. 2010, the temperature 99□F (37.2□C) as reported in Entergy's Discharge Monitoring Reports. See Entergy's Jun. 2011 DMR and Jul. 2010 DMRs.

[48] Lawton B., Maietta R., Paar J., and G. Szal. Jan. 3, 2000. *Memo: Recommendations and concerns of federal and state representatives on the Pilgrim Station modeling sub-committee for 2000.*

[49] Lawton R., et al. Mass Division of Marine Fisheries. Dec. 30, 1992. Drafted for Boston Edison. Pilgrim Nuclear Power Station, Marine Environmental Monitoring Program, Report Series No. 5. *Final Report on Irish moss (Chondrus crispus) harvesting along the Plymouth shoreline and impact assessment of Pilgrim Station on the fishery, 1971-1982.* 37 pp.

[50] ENSR. 1997. *Benthic algal monitoring at the Pilgrim Nuclear Power Station (qualitative transect surveys), January-December 1996*. Draft Semi-Annual Report to Boston Edison, No. 49.

[51] Szal G.M. Dec. 5, 2005. Technical Memorandum for the Record*. Pilgrim Nuclear Power Station: review of intake and discharge effects to finfish.* In: *South Shore Coastal Water Quality Assessment Report*.

[52] Boston Edison. June 1980. *Benthic Map Overlays and Assessment of Benthic Monitoring Programs* [Vol. 1]. Pilgrim Nuclear Power Station. Nuclear Engineering Dpt. Environmental Sciences Group. 49 pp.; Szal G.M. Dec 5, 2005. Technical memorandum for the record. *Pilgrim Nuclear Power Station: review of intake and discharge effects to finfish*. Appendix G. In: *South Shore Coastal Water Quality Assessment Report*.

[53] Entergy Nuclear Generation Company v. MassDEP, 459 Mass 319 (2011). "In addition, States retain the right to impose pollution control limits that are more stringent than the "floor" set by Federal law....Before a Federal permit may issue, the relevant State first must certify that the permittee's activities will not violate the State's water quality standards...This "State certification" process ensures that holders of Federal permits respect and uphold State standards....The State Act, G. L. c. 21, §§ 26-53, confers on the department "the duty and responsibility . . . to enhance the quality and value of water resources and to establish a program for prevention, control, and abatement of water pollution." G. L. c. 21, § 27. Like the Federal Act, the State Act creates a comprehensive permitting program to ensure water quality standards are met. Id. at §§ 27 (6), 43-44. No one may "discharge pollutants . . . [or] engage in any other activity that may reasonably be expected to result, directly or indirectly, in discharge of pollutants into waters of the [C]ommonwealth . . . without a currently valid permit" issued by the department. Id. at § 43 (2). Permits may include not only discharge limitations but also any "additional requirements . . . necessary to safeguard the quality of the receiving waters." Id. at § 43 (7). Violation of the terms of a permit is punishable by civil and criminal penalties. Id. at § 42." Despite the strong message the state's highest court has sent to MassDEP, it continues to shirk its responsibilities to enforce state water quality standards with regard to Pilgrim.

[54] Federal Water Pollution Control Act, 33 USCS 1341.

[55] Mass. Surface Water Quality Standards, 314 CMR 4.0(5)(d) and 4.05(4)(a).

[56] JRWA and Pilgrim Watch contention on "(1) Violations of state and federal clean Water Laws, (2) Lack of Valid State § 401 Water Quality Certification; (3) Violation of State Coastal Zone Management Policy; and (4) Violation of NEPA," filed May 14, 2012.

[57] NRC Atomic Safety and Licensing Board, Memorandum and Order, ASLBP 12-291-08-LR-BD01, July 20, 2012, p. 9.

[58] Letter to state officials from Ecolaw, Oct. 5, 2012. Re: Written Notification of Damage to the Environment, G.L. c. 214, § 7A Pilgrim Nuclear Power Station, Plymouth, MA: NPDES Permit No. MA 0000355.

[59] The expert federal agencies are the USFWS (responsible for terrestrial and fresh water fish species) and NOAA Fisheries (responsible for most marine species).

[60] JRWA petitions for leave to intervene and file new contentions under 10 C.F.R. § 2.309(a)/(d) or in the alternative 10 C.F.R. § 2.309(e) and JRWA and Pilgrim Watch motion to reopen under 10 C.F.R. § 2.326 and request for a hearing under 10 C.F.R. §2.309(a)/(d). Mar. 8, 2012. Docket #50-293 LR.

[61] In Cape Cod Bay and Coastal Zone Management Areas (Barnstable and Plymouth counties only). State-listed rare species include those with special concern, threatened, endangered status as of 2012; includes flora and fauna. Based on data requested from the Natural Heritage and Endangered Species Program of the MA Division of Fisheries and Wildlife, 2012.

[62] Pettis H. 2013. *North Atlantic Right Whale Consortium 2013 annual report card.* Report to the North Atlantic Right Whale Consortium, Nov. 2013.

[63] Cape Cod Bay, Great South Channel, Bay of Fundy, and Roseway Basin; Pendleton D.E., et al. 2012. *Weekly predictions of North Atlantic right whale Eubalaena glacialis habitat reveal influence of prey abundance and seasonality of habitat preferences.* Endangered Species Research. 18: 147-161.

[64] Mass. Ocean Management Task Force Technical Report. 2004. *Estuarine and Marine Habitat.* p. 101-127.; Mayo C.A., et al. 2004. *Surveillance, monitoring, and management of North Atlantic right whales in Cape Cod Bay and adjacent waters – 2004*. Final report submitted to the Commonwealth of Mass., Division of Marine Fisheries. Center for Coastal Studies, Nov. 2004.; Delorenzo A.S. 2005. *An assessment of the habitat quality and nutritional intake of North Atlantic right whales in Cape Cod Bay*. Dissertations and Master's Theses from the University of RI. Paper AAI3186903.

[65] Declaration of Regina Asmutis-Silvia, Whale and Dolphin Conservation, regarding the Jan. 2013 sighting of Wart and calf in Cape Cod Bay. Mar. 21, 2013.

[66] Memo to Jones River Watershed Association, Kingston, MA from Charles "Stormy" Mayo, Ph.D., Senior Scientist, Director, Right Whale Habitat Studies, Senior Advisor, Whale Disentanglement Program, Center for Coastal Studies, Provincetown, MA. Apr. 12, 2012.

[67] Affidavit of I.C.T Nisbet. Apr. 30, 2012. From: JRWA and Pilgrim Watch request to reopen, for a hearing, and to file new contentions and JRWA motion to intervene on issues of: (1) violations of state and federal clean water laws; (2) lack of valid state §401 Water Quality Certification; (3) violations of state Coastal Zone Management policy; and (4) violation of NEPA.

[68] 16 U.S.C. 1801 et seq.

[69] For a full list of species, see the NOAA Fisheries Habitat Conservation Division website at http://www.nero.noaa.gov/ro/doc/webintro.html

[70] NRC. Generic Environmental Impact Statement for license renewal of nuclear plants. Supplement 29 regarding Pilgrim Nuclear Power Station. NUREG-1437, Supplement 29. Vol. II (Appendices). See page E-15 for NOAA Fisheries Comments.

[71] Entergy. 2000. Pilgrim Nuclear Power Station Supplemental §316 Demonstration Report to EPA.

[72] Letter to EPA from MassCZM, Jun. 27, 2000. Re: MCZM review of the Entergy-Pilgrim Station §316 Demonstration Report.

[73] Entergy's area-swept study was performed for the 20th consecutive year in 2014.

[74] Letter to Entergy from EPA, Mar. 23, 2000, regarding the 2000 marine fish monitoring programs and plans for Pilgrim Nuclear Power Station.

[75] Entergy. 1999. *Final report on rainbow smelt (Osmerus mordax) restoration efforts in the Jones River, 1994-1999*. PNPS Marine Environmental Monitoring Program, Report Series No. 8. (Mass. DMF, Lawton R. and J. Boardman)

[76] NOAA. 2007. *Species of concern: rainbow smelt (Osmerus mordax)*. Fact sheet.

[77] Mass. DMF. 2006. *Rainbow smelt (Osmerus mordax) spawning habitat on the Gulf of Maine coast of Massachusetts*. Technical Report TR-30.

[78] Based on data from 1974-1999; Stratus Consulting. 2002. *Habitat-based replacement costs*. Report for the U.S. EPA, Region 1.

[79] 16 U.S.C. 1452, § 303 (1) and (2)

[80] 301 CMR Section 20.00 to 26.00

[81] Letter to EPA from MassCZM, Jun. 27, 2000. Re: MCZM review of the Entergy-Pilgrim Station §316 Demonstration Report.

[82] JRWA and Pilgrim Watch contention on "(1) Violations of state and federal clean Water Laws, (2) Lack of Valid State § 401 Water Quality Certification; (3) Violation of State Coastal Zone Management Policy; and (4) Violation of NEPA," filed May 14, 2012.

[83] Letter to MassCZM from JRWA and Pilgrim Watch, Apr. 4, 2012. Re: MCZM July 11, 2006 Consistency Certification for Entergy's Nuclear Pilgrim Nuclear Power Station, Plymouth, MA.

[84] Communication from MassDEP attorney Robert Brown.

[85] Entergy v. MassDEP, 459 Mass. 319, page 332 (2011), citing Riverkeeper, Inc. v. U.S. EPA, 475 F. 3d 83, 90 (2007).

[86] Letter to NRC from EPA, Jul. 10, 2014. Re: Clean Water Act permit for Pilgrim Station in Plymouth, MA, and nuclear safety issues alleged by the facility.

[87] MassDMF. Jun. 21, 1994. Memo to the PACT. Re: Minutes from the 81st meeting of the A-T Committee. p. 2.

[88] Letter to EPA from Szal G.M. (PATC), Dec. 8, 1998. Re: Pilgrim Nuclear Power Plant.

[89] Oct. 5, 2012 Notice of Intent to Sue Letter, p. 12.

[90] For example, rainbow smelt spawning habitat enhancement in the Jones River. See: Entergy, 1999. *Final report on rainbow smelt (Osmerus mordax) restoration efforts in the Jones River, 1994-1999*. PNPS Marine Environmental Monitoring Program, Report Series No. 8. (Mass. DMF, Lawton R. and J. Boardman)

[91] Oct. 5, 2012 Notice of Intent to Sue Letter, p. 12.

[92] Entergy's discharge of tolyltriazole was theoretically "approved" in a letter from the EPA in 1995, long after Pilgrim's permit was finalized and outside of the normal permit modification process. Beginning in Feb., 2014 a leak was discovered associated with a valve attached to a "Fire Water Tank," which discharged trace amounts of sodium nitrite (a corrosion inhibitor and additive to industrial greases) and tolyltriazole into Cape Cod Bay from Pilgrim's outfall #001. Even if the discharges were lawfully within the NPDES permit, they discharges are allowed only through outfall #011, not outfall #001, where the leak occurred.

[93] NRC. *Generic Environmental Impact Statement for license renewal of nuclear plants. Supplement 29 regarding Pilgrim Nuclear Power Station*. NUREG-1437, Supplement 29. Vol. II (Appendices). See page E-15 for NOAA Fisheries Comments.

[94] Letter to EPA from MassCZM, Jun. 27, 2000. Re: MCZM review of the Entergy-Pilgrim Station §316 Demonstration Report.

[95] Letter to EPA from Szal G.M. (PATC), Dec. 8, 1998. Re: Pilgrim Nuclear Power Plant.

[96] Letter to Boston Edison from MassDEP (PATC), Oct. 15, 1998, regarding a number of recent recommendations of the A-T Committee regarding monitoring, plant impacts and fisheries habitat restoration.

[97] EPA. Mar. 2001. *Essential fish habitat assessment for reissuance of the discharge permit for the Pilgrim Nuclear Power Plant.* Draft Report submitted to NOAA Fisheries. 14 pp.